PARTS HEADQUARTERS INC.
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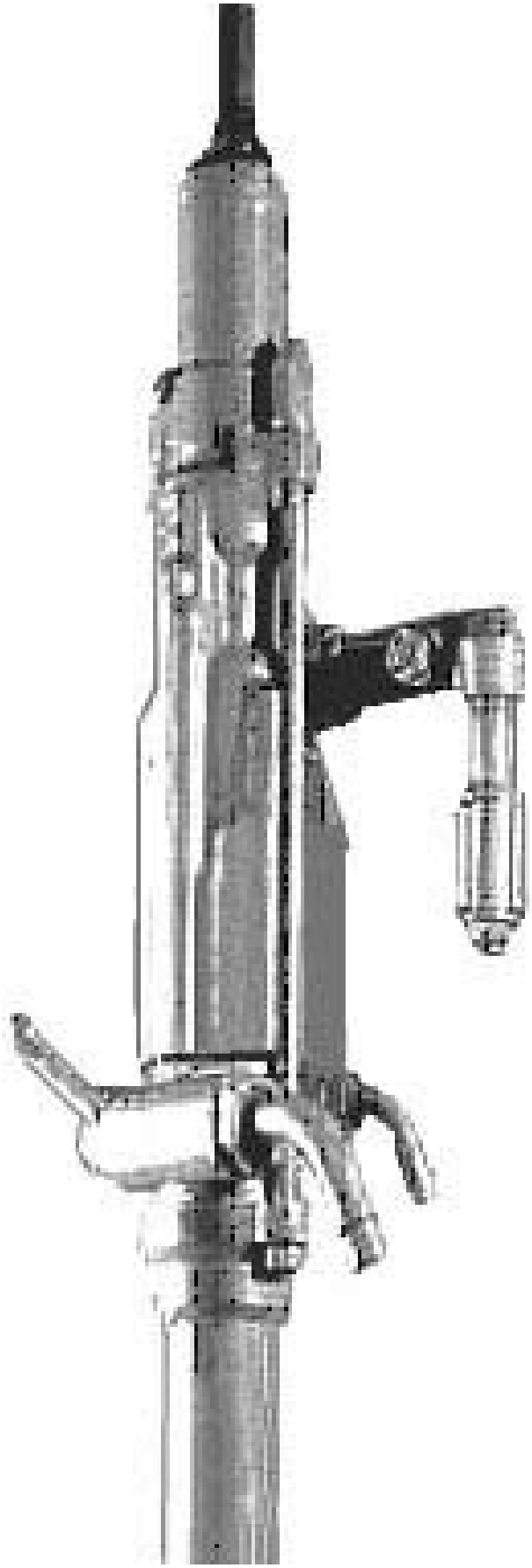
PHQ250 Stoper

Parts and Service Manual

PHQ250SMCSR
Stoper Drill
c/w Pusher Leg

5048912 JOY
Football Style
Lubricator



Safety Identification and Safeguards

WARNING Read and understand all safety instructions carefully before operating this machine. Failing to follow these instructions may result in serious personal injury.

Important Safeguards

- Keep clear of rotating equipment and never wear loose clothing to tangle in machinery
- Always maintain a clean and tidy work area. Pick up unnecessary items. Store tools.
- Avoid dangerous working environments and lack of ventilation.
- Do not operate equipment while under the influence of drugs, alcohol, or medication.
- Keep visitors at a safe distance and away from the work area where they may be injured.
- Wear protective equipment, hard hat, safety glasses, hearing protection and hard toed work boots.
- Read and understand the operations manual and any and all labels affixed to the machine.
- Use only genuine PHQ replacement parts. Failure to do so could cause rapid and severe damage to the machine or ultimately the operator. Pirate replacement parts may void the warranty of mating parts.
- Employ qualified service technicians to repair rock drills. An un-trained mechanic could possibly make errors in installing parts and cause severe damage to mating parts in the machine.
- Ensure that the drill and accessories comply with applicable company safety and health regulations.
- Do not exceed the rated capacity of any piece of equipment.
- Do not change or alter the drill, its components or accessories without prior approval from PHQ.
- Unauthorized alteration voids the warranty, and could render the equipment unsafe.
- Before moving a control, be certain what function it operates and the ramifications of that function.
- Proper breathing protection must be worn when working with materials producing airborne particles.
- Prolonged exposure to vibration causes serious arm/hand vibration syndrome disease (White Finger)
- For additional information on training or start up, contact your PHQ representative.

WARNING
Operating a Rockdrill without lubricant or with incorrect lubricant is the leading cause of failure of rock drill parts. Lack of lubrication can rapidly cause EXTENSIVE DAMAGE to the working parts of this machine. All Rockdrill repairs should be preformed by properly trained and equipped personnel.

NOTE: No claim for product warranty of premature failed parts will be considered when it is evident that the failures were caused by a prolonged lack of proper lubrication. No claim for product warranty of premature failed components will be considered by PHQ if parts other than those manufactured by PHQ are deemed to have caused the failure.

Certificate of Performance

This certificate supplied with each drill and is signed by the assembly mechanic assuring that 'the product has been tested and meets PHQ's quality standards. It lists the actual test results achieved by running the drill on a PHQ test bench at the time of assembly.

Parts HeadQuarters Inc

Form # PHQ-1901 Rev1

Part or Assembly Number	Rockdrill Torque Test Report		Report Number
Part or Assembly Name	Serial Number	Lot Number **N/A**	Report Date
Customer & Destination :	Work Order Number	Tested and Inspected by	
Cylinder Part Number	Test Level ☐ Unit Test ☐ System Test ☐ Acceptance Test ☐ Field Test		

	Air Line Pressure **P.S.I.**	Operating Pressure Full Throttle	Operating Air Flow **C.F.M.**	Feed Pressure **P.S.I.**	Retract Leg Feed Pressure	Maximum Torque At Full Throttle Ft/lbs.		Break Off Torque		Water Pressure Test
Test					N/A	1	2	1	2	
						3	4	3	4	

Remarks : Lubricated with Vultrex EP000 Rockdrill grease during assembly,

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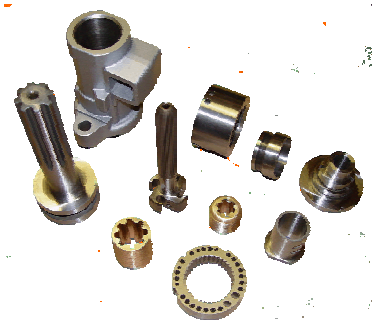


NOTE: PHQ continuously updates product literature to provide customers with the most current technical information available. Portions of this literature in time could contain information that may not be exactly representative of the current configuration of PHQ products. Contact your nearest PHQ representative for information on the latest product improvements and replacement literature available. The purpose of the manual is to provide service technicians with detailed information to achieve the maximum operating performance from PHQ products. Parts lists with corresponding exploded view schematic drawings are provided to aid in identifying parts needed for repairs and to facilitate ordering of proper parts for the assembly. Drawings are included at the appropriate area within the text. The drawings included are small through necessity. Large wall posters are available. PHQ personnel are proud to say they are backed up by over 50 years of experience in design, manufacture and operation of Percussive Drilling Equipment. Many of the accepted practices in use today were pioneered by some of the personnel working at PHQ.

To obtain the best performance and life of the equipment regular maintenance is required.

To obtain the best performance the machines should be operated in accordance with the instructions.

Ensure proper safety apparel is worn when transporting, servicing or using the equipment.

Ensure quality lubricant is used and the delivery system provides amounts sufficient to run the drill.

Inspect and replace worn front end and chuck parts promptly to improve the life of drill rods.

Ensure the drill is being operated correctly to avoid steel and drill rod misalignment.

Check air supply pipes and hoses and connections for flow restrictions or ingress of contaminants.

Listen to the drill for erratic running and insure the side rod bolts on the drill are properly torqued...

Provide new employees with time to read this manual before allowing them to operate the equipment.

Keep a master copy of this manual at hand at all times for reference should any questions arise.

Standard Warranty

For each new or used PHQ manufactured product and accessory, PHQ warrants that the product is free from defects in material and workmanship under normal; use and service for a 180 days from the date of first use (not to exceed one year from the date of shipment from a PHQ factory). The obligation under this warranty shall be limited to the replacement or repair of the failed product returned to PHQ. All warranty replacement is subject to inspection by a PHQ representative and the Quality Control Department at PHQ in Burlington, Ontario. PHQ will replace only parts that are judged to have been defective at the time of manufacture and assembly. This warranty does not apply to a product which has been altered, changed, or has been used and repaired then returned to a drill where the repaired part failed while in operation...

PHQ states that the product described in this manual shall not be merchantable or fit for any other purpose other than the operations described in the manual. No other warranties are expressed or implied.

Exclusive of Liability for Consequential Damages

In no event shall PHQ be liable for a customer's cost of lost production, increased cost, loss of profit, special indirect, incidental or consequential damages, and freight, brokerage, and shipping and storage charges.

Ordering Parts

PHQ requires the following procedures be followed and the proper information be supplied to expedite the filling of customer orders for parts and to eliminate delays and errors in shipping incorrect parts.

1. List the model of the assembly (EG: PHQ250SMCS Muffled Stoper Drill).
2. State the exact quantity of each item of parts required.
3. Identify items with the description and part number as shown in the parts section of this manual.
4. Specify the preferred method of shipment. (EG: Parcel Post. Courier, Truck Freight).
5. For overseas shipments specify the preferred method of shipment. (EG Air freight or sea freight).

Pricing is specified by PHQ in formal quotations and shipping terms can be included in quotations. All normal repeat part orders are priced according to INCOTerms2000 Ex-Works and FOB our factory in Burlington Ontario. Separate charges for transportation and export packing may apply.

Returning of New or Damaged Parts

If a customer wishes to return parts to PH due to overstocking or whether for repairs, replacement, or warranty, a letter of explanation should first be sent by e-mail, mailed or faxed to:

Parts HeadQuarters Inc.
C2-1175 Appleby Line
Burlington, Ontario
Canada L7L 5H9
ATTN: Sales Department
sales@partshq.com

Phn: 905-332-3271
Fax: 905-332-9497

This letter should specify the model number of the PHQ product (EG: PHQ250SMCS Stoper Drill) and list the parts by item that the customer wishes to return. The list should contain the Item part number, description and the quantity of each item. The letter should state the date of purchase (or order number) as well as a valid reason for requesting return. Parts returned by customers due to overstocking at the customers' location will be subject to a percentage restocking charge by PHQ.

DO NOT ship parts until authorized by PHQ Sales Department and shipping instructions are received.

All Parts returned to PHQ regardless of reasons must be shipped prepaid to PHQ.

Rockdrill Repair Shop

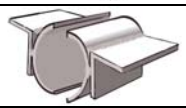
The rock drill repair shop should be a clean area equipped with all the usual filters' tools, work benches, component cleaning tanks and a hydraulic press. Your work shop should have the following items:

- PHQ Test Bench – custom designed and made to test torque generated by the drill and leg pressure. Every drill that is repaired in the drill shop should be "run-in" on the test bench using the spring loaded device that allows the drill to be run under load and leg pressure
- Work Bench – 91.4cm x 213.4 cm (36" x 84") c/w air bulkhead (optional)
- 15.2 cm (6") Vice (fixed type) mounted on the corner of the bench
- 10.2 cm to 20.3 cm (4" to 8") Chain Vice mounted on opposite corner of bench
- Steel block or press – two 7.6 cm x 7.6 cm x 45.7 cm (2" x 3" x18") with slider stop bars
- Electric pump driven solvent wash cleaning tank
- Bench Grinder 8" diameter one coarse and one fine stone (optional)
- Belt (Sand Paper) Grinder c/w back support for grinding parts
- Acetylene Oxygen – Cutting torch set c/w twenty foot hoses.
- Welding machine (optional)
- Sliding eight to ten drawer metal cupboards for parts
- Pin Skids
- Electric cord with auto rewind fancily – wall mounted
- Four foot four bulb fluorescent lighting over work bench. Small pencil light.

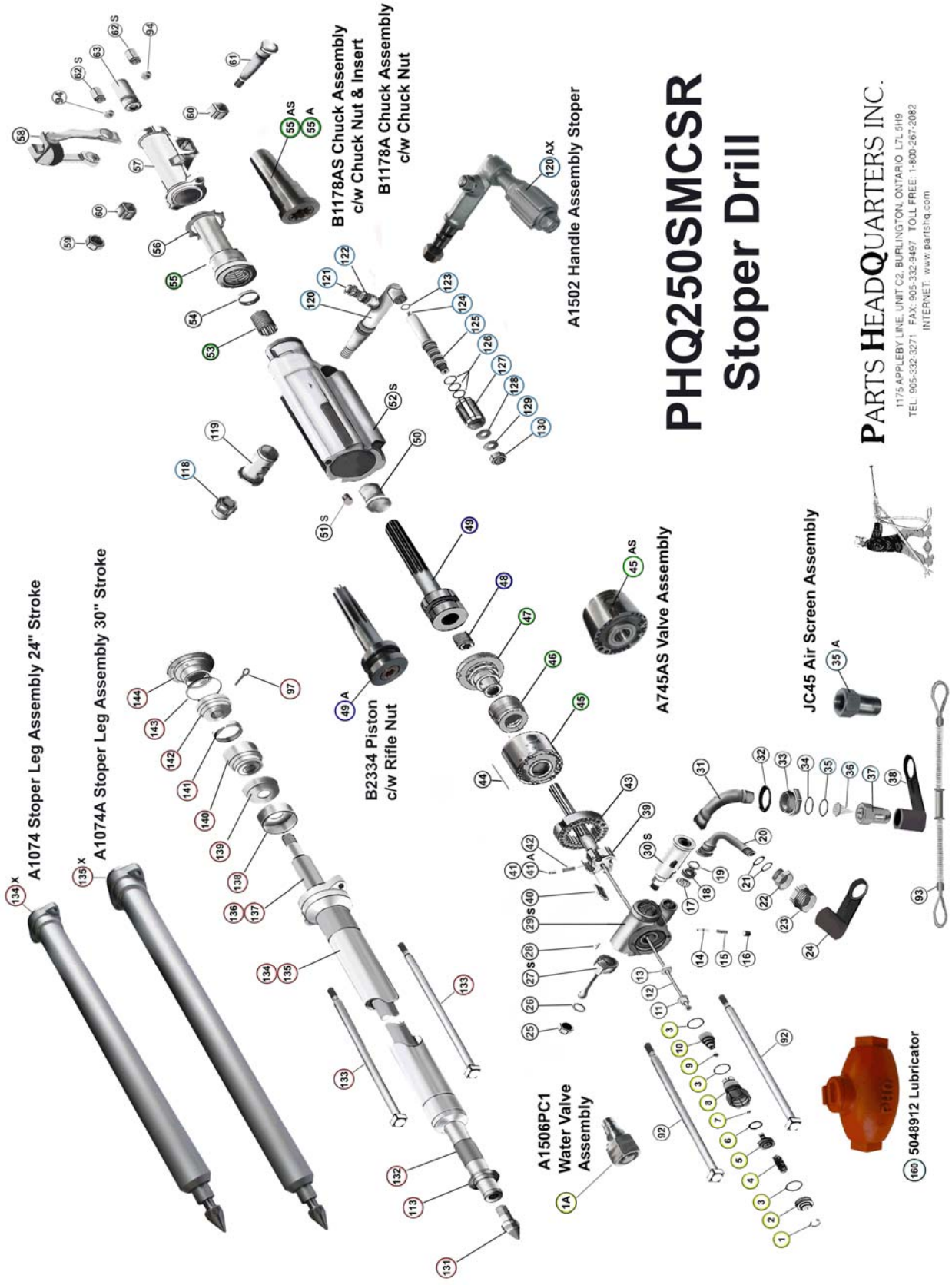
Your tools should include:

- PHQ S250 Tools Repair kit (Part Number PHQ250T
- Torque Wrench with 12.7 mm (1/2") drive (up to 250 ft/lbs)
- Pneumatic Impact Socket Wrench 12.7 mm (1/2") Drive
- Standard Pipe Wrench 61 cm (24")
- Standard Pipe Wrench 30.5 cm (12")
- Miner's Combination Crescent Wrench 38mm (1-1/2")
- Drive Socket 38mm x12.7mm (1-1/2" x 1/2")
- Drive Socket 36.5 mm x 12.7mm (1-7/16" x 1/2")
- Sockets 15/16", 1-1/16", 1-7/16", 1-1/2"; 15"
- Allen Key: 3/16", Allen Key 3/8"
- Pick Set and Miscellaneous carbide grinding heads for ½ electric drill
- Mechanic's Hammer
- 12.7 mm x 304mm (1/2" x12") plate c/w chuck nut removal tool, rifle nut, removal tool
- Rigid 3 ½; column bar, short arm with swing and dump and short guide shell (for S-36 repairs)
- Repair Tags and Report Sheets

PHQ S250SMCS Repair Tool Kit

1	C1811A*		**Air Inlet Cover** – Used to cover JC45 inlet adapter.
2	C1811W*		**Water Inlet Cover** – Used to cover 3/8"–1" adapter.
3	C3720		**Chuck Insert Wear Gauge** – Place in chuck insert across flats. If top of the insert is more than halfway up gauge, insert should be changed
4	SECP1		**Piston Removal Tool** – Remove Piston and Valve Assy from Cylinder. Remove fronthead and chuck insert punch into piston and hammer out.
6	SG002		**Air Gauge** – Measure Airleg pressure. Attach (qty 2) to SG001.
7	T201		**Cylinder Bushing Extractor** – Used to remove brass bushing from inside cylinder and remove bushing from the Stoper Leg.
8	T203		**Stoper Punch** – Remove Stoper handle bushing form cylinder.
10	T205		**Valve Chest Assembly Tool** – For assembling valve chest and installing valve chest in cylinder.
11	T206		**Valve Chest Punch** – To disassemble valve chest. Insert punch into top of valve box, hammer out.
13	T217		**Chuck Insert Remover -** For collared steel chucks. Place chuck in chuck removal support ST218 and push insert out with hydraulic press.
14	T218		**Chuck Removal Support –** To remove chuck inserts place chuck Assy in support and use T555 or T217 punch to push out on hydraulic press.
15	T221		**Chuck Insert Punch** – To insert collared chuck insert place the insert in chuck T218 and push insert in hydraulic press until flush with chuck.
16	T223		**Stoper Cylinder Mandrill-** Remove small dents from Stoper leg by forcing T233 through the inside diameter of the cylinder.
19	T555		**Chuck Insert Punch** – Insert and remove collarless steel chuck insert. Place the chuck in support T218. Push the insert in using the hydraulic press until the face of the insert is level with circumference of chuck.
20	T556		**Socket –** Use with an impact gun to remove the spike from Stoper Leg.
21	T209		**Feed Cylinder Clamp** – Used to grip the Stoper pusher leg cylinder in a shop vice

*Minimum order quantity 20


PHQ250SMCSR
Stoper Drill
PARTS HEADQUARTERS INC.
1175 APPLEBY LINE, UNIT C2, BURLINGTON, ONTARIO L7L 5H9
TEL: 905-332-3271 FAX: 905-332-9497 TOLL FREE: 1-800-267-2082
INTERNET: www.partshq.com
A1074 Stoper Leg Assembly 24" Stroke
A1074A Stoper Leg Assembly 30" Stroke
B1178AS Chuck Assembly c/w Chuck Nut & Insert
B1178A Chuck Assembly c/w Chuck Nut
A1502 Handle Assembly Stoper
B2334 Piston c/w Rifle Nut
A745AS Valve Assembly
JC45 Air Screen Assembly
A1506PC1 Water Valve Assembly
5048912 Lubricator

KEY	PART NUMBER	ASSY	DESCRIPTION COMPONENT
1A	**A10506PC1**		**WATER VALVE ASSEMBLY** C/W (1) (2) (3) (4) (5) (6) (7) (8) (9) (10)
1	20015	1	CIRCLIP
2	C1521PC1	1	CAP, WATER VALVE
3	1643903	4	O RING (164231)
4	D1406	1	SPRING, WATER VALVE
5	C1522PC1	1	VALVE POPPET
6	1645704	1	O RING (164521)
7	1648102	1	O RING (164301)
8	B1181PC4	1	HOUSING, WATER VALVE
9	D1673	1	SEAT, WATER VALVE
10	C2144	1	RETAINER, WATER VALVE SEAT
11	D1674	1	SPACER, WATER TUBE
12	C1574A	1	WATER TUBE
13	D1675	1	SEAL, WATER TUBE
14	D1383	1	PLUNGER, THROTTLE VALVE
15	D1382	1	SPRING, THROTTLE DETENT
16	2422P	1	PLUG, DETENT
17	C1272	1	SCREEN, WATER INLET
18	D1402	1	WASHER, WATER INLET
19	S2487	1	WASHER, WATER STEM THRUST
20	C1809	1	WATER STEM - THREADED
21	1646503	6	O RING (164811)
22	S2141	1	NUT, WATER STEM
23	1358356	1	HOSE SPUD 3/8" (F) (D2441)
24	C1811W	1	CAP, PLASTIC
25	D1385	1	NYLOC NUT, 5/8"-18UNF LOW PROFILE
26	149163MT	1	LOCK WASHER, M16 BELLEVILLE
27S	C1509S	1	HANDLE, THROTTLE (STOPER)
28	D1384	1	KEY, THROTTLE
29S	A705	1	BACKHEAD (STOPER)
30S	B1176S	1	VALVE, THROTTLE (STOPER)
31	C1525N	1	AIR BEND
32	D1601	1	WASHER, AIR BEND NUT
33	C1526	1	NUT, AIR BEND
34	1648114	1	O RING (164731)
35A	**JC45**		**AIR SCREEN ASSEMBLY** C/W (35) (36) (37)
35	910660211	1	O RING (JC45)
36	355538	1	SCREEN

KEY	PART NUMBER	ASSY	DESCRIPTION COMPONENT
37	1356588	1	HOSE SPUD (3/4" F X 1" M REDUCER)
38	C1811A	1	CAP, PLASTIC
39	B5053	1	RIFLE BAR (REVERSIBLE) (B1173R)
40	D6177	4	PAWL, RATCHET (REVERSIBLE) (D1381R)
41	S2134	4	PLUNGER, PAWL
41A	S2134P		PLUNGER, PAWL NYLON
42	D1611C	4	SPRING, PAWL
43	B1170	1	RATCHET RING (35 TOOTH)
44	S2128	1	PIN, VALVE BOX (D1397)
45AS	**A745AS**		**VALVE ASSEMBLY** **C/W (45) (46) (47)**
45	A745	1	VALVE BOX
46	C1648	1	VALVE
47	A744	1	PLUG, VALVE
48	C1508	1	RIFLE NUT
49A	**B2334A**		**PISTON ASSEMBLY** **C/W (48) (49)**
49	B2334	1	PISTON
50	C1517	1	LINER, FRONT CYLINDER
51R	1643403	1	O RING (164311)
51S	D2105	1	RUBBER PLUG (STOPER)
52S	E394M	1	CYLINDER - MUFFLED
53	C1512	1	CHUCK NUT
54	C1516		CHUCK NUT SPACER
55	B1178	1	CHUCK
55A	**B1178A**		**CHUCK ASSEMLY** **C/W (53) (55)**
55AS	**B1178AS**		**CHUCK ASSEMLY** **C/W (53) (55) (63)**
56	NB500P		FRONTHEAD GASKET PLASTIC
56A	NB500		FRONTHEAD GASKET COPPER
57	A2598A	1	FRONTHEAD
58	A2599	1	STEEL RETAINER
59	12812UF	1	LOCK NUT, M20 NYLOCK
60	D6205C	2	BUFFER
61	C6908	1	PIN, STEEL RETAINER
62S	D1388D	2	NUT, SIDE ROD (STOPER) (SINKER)
62S	D1388D	2	NUT, SIDE ROD (STOPER) (SINKER)
63	C1418A	1	CHUCK INSERT (7/8" HEX.)
93	WHIPCHECK	1	SAFETY WHIPCHECK (1/8" X 22")
94	D2154	2	SIDE ROD WASHER (STOPER) (SINKER)
97	225414	1	COTTER PIN

KEY	PART NUMBER	ASSY	DESCRIPTION COMPONENT
113	1973854	1	HAT PACKING
118	D1454D	1	OPERATING HANDLE ADAPTER NUT
119	C2549	1	CYLINDER LUB BUSHING
120X	**A1502**		**HANDLE ASSEMBLY STOPER** C/W (118) (120) (121) (122) (123) (124) (125) (126) (127) (128) (129) (130)
120	B1194	1	ADAPTER OPERATING HANDLE STANDARD
121	D1433	1	VALVE ASSEMBLY, FEED RELEASE
122	164221	1	O RING
123	164311	1	O RING
124	C86271	1	TUBE
125	B1193A	1	OPERATING HANDLE SPINDLE (For B1194)
126	164921	3	O RING (1647804)
127	C1570	1	TWIST GRIP
128	D1989	1	OPERATING HANDLE WASHER
129	D2014	1	LOCK WASHER 3/4 BELLEVILLE
130	D1989	1	LOCK NUT 3/4 16UNF NYLOCK
131	D2547	1	SPIKE
132	D1707	1	END CAP BUSHING
133	C1582C	2	SIDE ROD (STOPER) (SINKER)
134	B1657	1	LEG CYLINDER, 24" STROKE
134X	**A1074**		**STOPER LEG ASSEMBLY 24"STROKE** C/W(97) (113)(131)(132)(134)(136)(138)(139)(140)(141)(142)(143)(144)
135	B1654		LEG CYLINDER, 30" STROKE
135X	**A1074A**		**STOPER LEG ASSEMBLY 30"STROKE** C/W(97) (113)(131)(132)(135)(137)(138)(139)(140)(141)(142)(143)(144)
136	B1659	1	PISTON ROD, 24" STROKE
137	B1656		PISTON ROD, 30" STROKE
138	C2214	1	PISTON ROD SPACER
139	1790385	1	BUCKET
140	C2213	1	BUCKET SPACER
141	D1664	1	PISTON ROD SPRING CLIP
142	D1665	1	PISTON ROD LOCK NUT
143	164671	1	O RING (1647824)
144	B1583	1	BACKHEAD CAP
170	5048912	1	LUBRICATOR

Maintenance Procedures

The maintenance of all rock drills follows the same routine. First clean the exterior of the drill then make a quick visible check to look for items requiring a minor repair that could have shut the drill down before stripping the drill down. (EG worn chuck bushing, broken water tube, air connection missing or damaged, water valve loose, water connection damaged or missing, side rod nut missing or broken side rod). If no visible problem exists connect the air line with the leg still connected to the drill and start the drill up on low throttle if possible. Look into the front end to check the end of the piston for rotation and check the action of the leg using the control handle. Listen for leaking air. If the problem is still not evident shut the drill down disconnect the air line and strip the drill down examining the parts as each is removed. Clean the parts, inspect each part in detail, replace damaged parts, rebuilt and test the drill. Most drill shops lack sophisticated measuring equipment to accurately gauge wear on components. An experienced drill doctor relies on his experience to visually check parts for wear and to test for "fit, feel, and function" to determine if the parts should be replaced or not. Parts can be assessed using simple, but effective work shop practices and knowledge gained over years of experience.
NOTE: After unit is completely disassembled and prior to full inspection all components must be thoroughly cleaned in a suitable pump driven solvent wash tank, and blown clean.

Disassembly Procedures

Most of the moving parts inside PHQ250 Stoper drills are interchangeable with parts in PHQ250 Jackleg drills and the disassembly, maintenance, repair, replacement and assembly is the same.

1. With the drill secure in the chain vise on the bench unscrew the large closed ended domed nut (D1454D) on the stem end of the operating handle (B1194). This nut holds the control handle firmly in the boss protruding from the cylinder of the rock drill.

2. With the nut loose and partially removed tap with a copper mallet to break the grip of the taper on the handle and remove the complete handle from the drill.

3. Unscrew the twist grip lock nut (D1990) and remove the twist grip (C1570).

4. Unscrew the pressure release valve (D1433) and remove from bore. Clean and replace.

5. Unscrew the operating handle spindle (B1193A) from the handle adapter.

6. Replace the three O-rings (164921) whenever the handle is disassembled.

7. Inspect all parts and replace the one small O-ring (164311) in the orifice into which the small end of the operating handle is fitted.

8. Measure the working diameter of the control body and replace if worn. Check the bore of the twist grip and replace if deep groove are present from the wear caused by rubbing of the O-rings.

Air Connection Assembly Removal

9. Unscrew hose spud (1356588) from air bend (C1525N). Check the air inlet screen (355538A) for damage and replace along with O-ring (164999).

10. Unscrew the air bend nut (C1526) from the backhead. Always replace the copper washer (D1601). Replace any worn or damaged parts as the air connection nut and bend are safety critical.

If the air connection releases from a drill during operation the hose will injure the driller!

Water Connection Assembly Removal

11. Unscrew the water inlet adapter stud (D2441) from the water stem (C1809) and unscrew water stem nut (S2141)from the backhead of the drill

12. Remove water stem thrust washer (S2487) inlet washer rubber (D1402) from the backhead of the drill. Remove the water inlet screen (C1272) with a small screw driver or a scriber.

13. Replace both O-rings (164811) as well as the stem thrust washer (S2487) and washer rubber (D1402) whenever the drill is in the shop for repair.. Check the screen filter and replace if damaged.

Throttle Valve Assembly Removal

14. Unscrew the throttle valve handle nut (D1385) on the end of the throttle valve. Remove the nut and disc spring (1491623MT) and slip off the throttle valve handle (C1509). Remove the throttle valve key (D1384).

15. Unscrew the plug (2422P) that retains the throttle valve plunger assembly and throttle valve plunger (D1383) and spring (D1382). This should be done before removing the throttle valve to prevent scratching or damaging the surface of the throttle valve. Check the throttle valve plunger to be sure it is still properly shaped to engage the ratchet teeth on the throttle valve. Check the spring for tension.

16. The throttle valve (B1176) should push out easily. If it is tight tap gently on the end of the valve with a bronze hammer and remove from backhead.

Steel Retainer Removal

17. Remove the steel retainer pin nut (12812UF) (D1932) from the steel retainer pin (C6908).

Tap the end of the steel retainer pin with a bronze hammer to loosen.

Push the steel retainer pin through the front end lug bore using a screwdriver or punch.

18. Pull the steel retainer pin through the lug on the front end and remove the steel retainer (A2599).

19. Remove both of the square plastic steel retainer pin bushings (D6205) from the housing using a screw driver.

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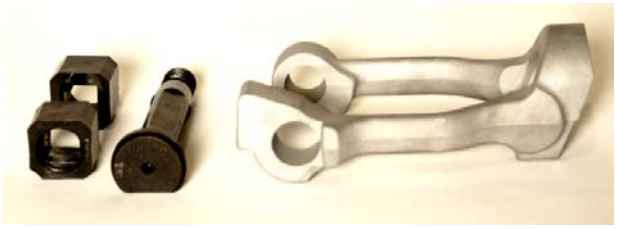
20. Examine all the parts for wear and replace any parts that are worn. Check the area of the steel retainer where the collar of the drill steel rides to be sure it is not worn out.



21. Unscrew the two side rod nuts (D188D) and washer (D2154) and remove from the side rods.

22. Withdraw the side rods through the backhead of the stoper (C1582C) and lift off the thrust leg as a complete assembly.

23. Remove the backhead cap (B1583) using two screwdrivers as shown.

24. Remove O-ring (164671) and replace.

25. Unscrew and remove the water control valve. Remove the water tube with the water control valve and separate the water tube from the valve.

Water Control Valve (Automatic Valve)

26. Remove circlip (20015) from water control valve body (B1181PC4) with a pair of circlip pliers that are designed just to remove circlips. Remove the water valve spring cap (C1521PCT). Replace the circlip and cap if damaged or worn.

27. Remove the water valve seat retainer (C2144) and the spring (D1406). Check the tension on the spring and replace if too loose.

28. Remove water valve (C1522PC1) Check O-rings (164521) and (164301) Replace if damaged or worn.

29 Check all the valve parts to be sure they are in good condition. Reassemble the valve coating parts lightly with Vultrex triple zero grease and set aside to wait reassembly in the drill.

30. Whenever the water tube is inserted into the drill always place the raised washer end of the tube into the water control valve to re-insert into the backhead to be sure the end of the tube is well seated in the water control valve.

Back Head Removal

31. Lightly tap the backhead (A705) to free it from the ratchet ring (B1170). The backhead components are similar to those used in the Jackleg (Airleg).

Front Head Removal

32. The fronthead (A2598A) should slip easily off of the cylinder (E394). If not tap the fronthead gently with brass hammer to loosen. Remove the front head and examine the mating surfaces between the fronthead and the drill cylinder for wear. If the surfaces are cracked, indented or irregular these major components may need to be replaced. .

33. Remove the chuck driver assembly from the fronthead.

Check the hexagon bore of the chuck bushing (C1418A) in the chuck (B1178) with the chuck gauge provided in the service kit. If the gauge drops 0.75” into the bushing indicating wear the bushing must be replaced. If the bushing is cracked or chipped it must be replaced before it does damage to drill steel. Set the driver assembly aside until later. If the chuck shows no sign of lubrication check the port that carries lubrication to the chuck in the front end to see if it is plugged.

Removal of Ratchet Ring, Rifle Bar and Valve Chest

34. Using the piston removal tool push the piston back until it touches the valve chest. Hammer gently on the face of the piston to push the ratchet ring until it protrudes about one inch out of the cylinder bore.

35. Remove the valve box locating pin (S2128) from the groove in the cylinder using needle nose pliers.

36. Remove the ratchet ring (B1170). Examine the teeth on the inner diameter of the ring for chipping or wear. The ratchet ring is reversible and it is advisable to reverse sides whenever removing the ratchet ring to even out wear.

37. Remove the rifle bar (B1173B) and check the spiral flutes for wear. Set the rifle bar complete with ratchet pawls aside to examine in detail later. Reversible pawls can safely be turned to the un-used side to get more life.

38. Using the piston removal tool hammer push or hammer gently on the face of the drill piston to push the valve chest assembly out of the cylinder until it drops in you hand.

Continue pushing on the piston (B2334) until it emerges from the drill cylinder and catch it in your hand. Examine the striking face of the piston and the flutes for signs of wear. If the striking face is chipped the piston must be replaced.

Valve Chest Disassembly

39. Valve chest disassembly must be done using the proper valve punch T206. Hold the valve chest box in one hand. Place with the small end of the valve plug facing up. Fit the punch in the bore of the plug and strike the punch with a brass hammer until the valve box (A745) separates from the valve plug (A744).

40. Once the valve plug (A744) is loosened remove the valve plug (A745) from the valve box. Remove the valve (C1648) from the valve box (A745). Wash all the valve parts in Varsol and blow dry. Check that the parts are clean and free from debris. Check for sharp edges on the components caused by long use. Sharp edges cause the drill to run erratically and should be removed with emery cloth. Take care to just remove the sharp edge.

41. Align the valve properly on the stem of the valve plug. Push to mate with the face of the plug. Cover the two holes in the large diameter of the valve plug with your fingers. Pull the valve away from the mating surface. If it moves easily there is no suction created and the valve is worn.

42. Reassemble the valve and holding the assembly firmly in both hands shake back and forth. Listen for a clicking noise that signifies the automatic valve is moving inside the valve. If no distinct clicking is heard the valve is jamming. The valve must be disassembled to find the cause before returning it to the drill. The valve surfaces are precision ground to within thousands of an inch so never hand grind the faces of the automatic valve or the inner faces of the valve box.

Inspection and repair of the striking face of the Piston

43. Inspect the striking face of the piston (B2334). If the striking face is not dished more than 1.0 mm (0.04 inch) you may reface the piston. Grinding of the face of pistons should be carried out in a proper machine shop where the piston is steadied in a turning jig to align the face to be ground square to the piston axis. The head must be quickly ground on a good belt grinder so that low heat is produced. Remove the raised portion and try to leave the original dished surface of the piston face. The piston should be replaced if the outer thickness of the splines at the front end are worn down to half the original size or if the piston striking face is chipped or cracked in any way.

44. The case hardening on the face of the piston is approximately1.3 mm (0.050 inch) deep so that removal of material must not exceed 0.7 mm (0.040 inch). An “egg-shell” affect is created grinding the piston face by seriously reducing the case hardened depth. The life of a reconditioned piston can be expected to be about one half of what is normally expected performance. It is often more economical to replace worn pistons.

Inspection of the fit of Piston (B2334) and the Cylinder (E393) (E393M) bore

45. To establish consistency in testing always test the cylinder with inner surfaces of the cylinder bore and outside surfaces of the drill piston free from oil. The test relies on the "feel" of the fit and function of movement of the piston within the bore and the sounds generated during testing

46 .The piston must be replaced when the head of the piston is worn down. Proper sophisticated measuring equipment to accurately gauge the wear on a piston head or in a cylinder bore is not available in most rockdrill service workshops. Cylinder and piston wear can be gauged by simple but effective established workshop practices. Place the cylinder so the font end is face down on a flat work bench. Align a new piston with the large head in the cylinder bore wrong way down. Always use a piston free of oil so that the comparison is always done under the same conditions. Grasp the splined end of the piston and slowly rock the piston back and forth in the cylinder to check the clearance. If the rocking motion of the striking end of the piston is greater than 3mm (0.12") the cylinder is oversize. If the new piston is tight remove the new piston and replace with the used piston. If the same rocking motion is evident, it indicates that the piston is worn oversize and must be replaced.

Front Cylinder Assembly

47. The clearance between the outer diameter of a new piston stem and the inner diameter of the bronze front cylinder washer liner is nominally 0.047mm (0.0015"). The clearance between a worn piston stem and a worn bronze cylinder liner bore is 1.6mm (0.063") or larger. If the cylinder liner does not visibly appear to be worn it still should be tested with the piston installed in the normal operating position in the cylinder bore with the stem through the cylinder liner.

48. To measure the compression fit of the piston and cylinder liner place the drill cylinder body flat on the bench and advance the piston fully through the liner. With one hand gripping the spline end of the piston and the other the front part of the cylinder body push the piston back into the drill as far as it will go then pull it rapidly forward until it stops on the cushion of air above the liner.

Hold a thumb against the splines of the piston and slowly pull the piston out of the cylinder. One should be able to pull the piston face approximately three quarters of an inch further through the cylinder.

49. An alternate method to measure the compression fit of the piston and bronze cylinder washer liner is to hold the cylinder in a vertical position and push the piston up from underneath to let it free fall down into the cylinder. The piston should bounce and then move slowly to the bottom of the bore against the cushion of air.

50 A good air cushion prevents the piston from bottoming too hard on the cylinder liner during the down stroke and provides a bounce to start the piston on its backward stroke during operation. If the piston head has proper clearance with the cylinder bore and there is no bounce of the piston on a cushion of air during the test then the bronze front cylinder washer liner (C1517) must be changed to improve compression.

NOTE: It is very important that the distinct "pop pop" sound of a good air cushion is heard during this test, not the jarring "clank" sound of metal on metal impacting of the two parts.

51. To remove the bronze front cylinder washer liner (C1517) place the cylinder body under the piston of a hydraulic press. Use service tool T201 to press bronze liner out of the cylinder. If a press is not available the liner can be driven out by striking the T201 tool with a hammer.

52. To install a new liner stand the cylinder body on the press bench with the front end down. Carefully place a new bronze liner (C1517) in the front cylinder washer using the lead on the liner to align the bushing in the bore. A good method is to place the liner on a piston and insert the liner with the piston to be sure of alignment. Insert a second piston (B2334) with the head into the bore resting on the bronze liner or head of the first piston. Push the bushing with the hydraulic press until it bottoms out inside the cylinder with an audible "click".

53. Often the inside diameter of the bronze front cylinder washer (C1517) will shrink inwards due to the pressure on the outside diameter as it is pressed into place. Check that the piston stem moves freely through the bronze washer and if required hone the inside diameter until the fit is correct. The front cylinder washer liner test should be repeated after installing a new bronze liner and if metal on metal contact occurs repeat the inspection of the cylinder bore and piston head.

Chuck Insert

54. Inspect the hexagon bore of the chuck bushing with the plate gauge SC3720 provided in the service tool kit. Replace the chuck bushing if it is cracked, chipped or worn oversize. If the gauge enters the bushing across the flats 19,19mm (0.7555") or more, the insert is worn oversize. Worn chuck bushings damage drill steel and can cause the water tube to break off when the drill steel is very sloppy in the chuck bushing. Chipped bushings damage drill steel.

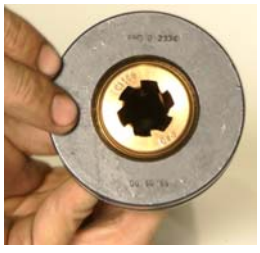
55. To remove the chuck bushing (CC1418A) place the chuck assembly in a used fronthead (A2598A) inverted between two steel blocks under the piston of a hydraulic press. Place the service tool T555 for collared chuck inserts in the bore of the chuck and press out the chuck bushing, It is important that all parts are correctly aligned in this pressing operation to avoid damage to the chuck.

Check the top outer diameter of the chuck bushing and the top inner diameter of the chuck. If either is corroded there has been no contact between the bushing and the chuck and the chuck should be discarded as it no longer is supporting the front of the chuck bushing. Rule of thumb says that up to five chuck bushings can be replaced in one chuck before the chuck is worn out.

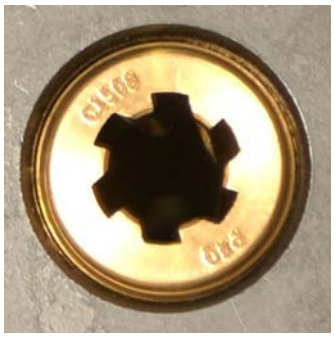
56. To replace the chuck bushing, invert the chuck under the piston of a hydraulic press and insert the chuck bushing and tool T221 for collared insert and T555 for collarless insert in the open end. Carefully align the chuck, chuck bushing and the pressing tool and drive the chuck bushing home until fully sealed.

The interference fit between the chuck bushing and the chuck is nominally two thousanths of and inch and requires from six to fifteen tons of force to push into place. The bushing hits bottom with an audible "bang" when properly pushed into place in a hydraulic press.

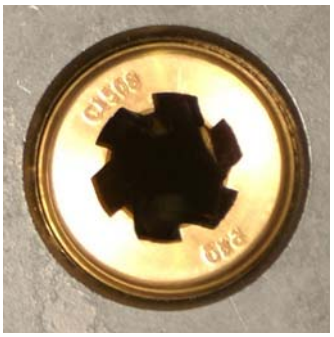
Rifle Nut Removal



57. Inspect the (flutes) splines of the rifle nut (C1508) and replace when the splines are worn down past 50% of original thickness. Rule of thumb says that the rifle nut should be replaced whenever the mechanic knows the drill will be used in a remote, inaccessible or difficult to get to work place to prevent the premature return of the drill to the repair shop.



C1508 RIFLE NUT NEW



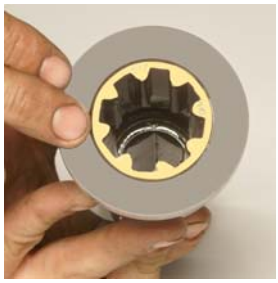
C1508 RIFLE NUT 50% WORN

C1508 RIFLE NUT 100% WORN

58. The mechanic can make a tool to remove a worn rifle nut (C1508) from a good piston (B2334) without damaging the piston by welding a steel handle across the bottom end of a used rifle bar to form a wrench. A good tool to hold the piston can be made by brazing a used (but fairly good) chuck nut (C1512) into a used chuck (B1178) and welding the chuck to the side of the work bench at working height in a convenient location. Insert the splines on the stem of the good piston into the spines of the chuck nut. Insert the wrench tool made from a used rifle bar into the rifle nut and unscrew the rifle nut from the piston head. Note: the rifle nut is left hand threaded so unscrew in a "clock wise" direction.

Chuck Nut Removal

59. Inspect the splines of the chuck nut (C1512) and replace when splines are worn to half their original thickness. The mechanic can make a tool to remove chuck nuts by welding a steel handle across the head of a piston (B2334) to create a wrench. A good tool to hold the chuck is the collar of a drill rod welded to the side of the shop bench at work height in a convenient location. Slide the chuck insert onto the drill rod collar and using the fabricated wrench unscrew the chuck nut out of the chuck. The nut is left hand threaded so unscrew in a clockwise direction.



C1512 CHUCK NUT NEW

C1512 CHUCK NUT 50% WORN

C1512 CHUCK NUT 100% WORN

60. Place the chuck insert onto the collar of a drill rod that has been cut and welded to a steel bench or other rigid support. Place the splines of the Chuck Nut Wrench tool into the splines of the chuck nut. Turn the handle clockwise to remove the left hand threaded chuck nut.

61. An alternate method of removing a chuck nut is to grip the chuck firmly in the jaws of a bench vice with copper jaw inserts across the flats provided for the purpose. Unscrew the chuck nut using a service tool made from an old piston stem welded onto a handle or with flats ground to take a large crescent wrench. The parts are left hand threaded.

These same tools are used to install rifle nuts in pistons and chuck nuts in chuck drivers.

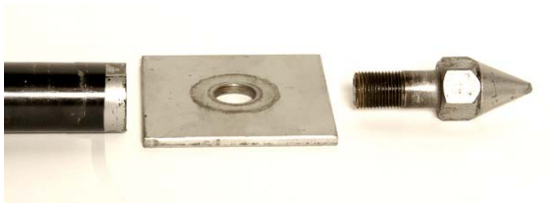
Servicing the Stoper Leg

62. Pull the piston rod (B1659) out of the cylinder (B1654). Inspect cylinder for dents. Remove small dents from cylinder with service tool T223. Remove O-ring from large bore and replace.

63. Whenever it is required to firmly hold the pusher leg for the stoper always clamp the leg in the shop vice using a set of

64. Remove the lip seal packing (1973864) in the bottom end cap of the leg cylinder and replace each time the leg is disassembled as this part wears out fairly rapidly.

65. To replace the spike (D2547) unscrew from the bottom end of the piston rod using tool T556



66. To replace the bucket seal, pick out the split pin from the small end of the piston rod. Unscrew the bucket spacer and locking rung components from the end of the piston rod.

67. Inspect the thrust leg parts. Replace as necessary.

D1707 End cap bushing
1973864 Lip seal packing
C2214 Piston rod spacer
17970383 Bucket
C2213 Bucket spacer
D1665 Piston rod lock nut

68. The lip side of the seal should be facing outwards from the cylinder. If the steel end cap bushing is worn, scored or corroded it should be replaced. Remove with service tool T201 by striking several blows with a copper mallet.

69. Always refit the end cap bushing using an assembled piston rod to ensure correct alignment

Assembly Procedures

70. To install a piston with the cylinder horizontal in the jaws of a vice use a rifle bar for alignment. Oil the stem end of the piston and insert into the cylinder bore guiding it with care not to strike the step for the valve chest seat in the cylinder.

71. To replace the valve box assembly (A745) place the cylinder upright on a flat work bunch and carefully insert the valve box assembly into the bore of the cylinder. Align the valve locating pin (S2128) in the groove in the valve box and cylinder. Place tool T205 on top of valve box assembly and gently tap the valve box home with a brass mallet. The valve box should fit fairly tight.

The valve chest assembly is the "heart of the drill". The valve controls the working of the drill by directing air to the proper ports to activate all the moving parts in the drill. Great care must be taken when removing, cleaning, examining and replacing the valve chest assembly in the drill.

72. Insert the ratchet ring (B1170) into the cylinder, taking care to align the groove in the ratchet ring to fit the valve locating pin (already installed). Gently tap around the circumference of the ratchet ring home with a brass mallet until the ratchet ring seats down snugly on top of the valve chest assembly.

73. Assemble the rifle bar parts. Rifle bar – reversible (B1173B) four ratchet pawls - reversible (D6177) four pawl plungers (S2134) and four pawl plunger springs (D1611C). If the pawls appear "rounded" reversible pawls can be turned once to present the square (not worn) side of the pawl to the teeth of the ratchet ring. This provides for extended life for these fast wearing parts.

74. To insert the rifle bar assembly, lightly oil the splined end of the rifle bar. Holding all four ratchet pawls closed (with the fingers of both hands); guide the stem of the rifle bar into place in the rifle nut. Insert the head carefully into the ratchet ring slowly turning at the same time. Oil the pawls in the ratchet ring. Check the pawl sequence by slowly turning the piston and listening to the action, the pawls should click into place in a 1, 2, 3, 4 sequence

75. With the machine returned to the horizontal position in the bench vice, insert the ferrule (D1390) and O-ring

76. Lightly oil the chuck and fit it into the fronthead and place the fronthead and chuck together over the peg on the workbench. Lightly oil the splines of the chuck nut.

77. Put the cylinder assembly over the fronthead assembly.

78. Fit the valve box locating pin (S2128) and the backhead complete with all its sub parts, in position. Insert the water tube with the water tube spacer and rubber in the same way as on the jack leg (Airleg) drill.

79. Fit the backhead cap. Note the relationship between the locating pin in the backhead cap and the backhead. Ensure the O-rings have been installed

80. Fit the thrust leg assembly over the backhead cap.
81. Insert the side rods. Tighten the side rods evenly from one to the other and back to a torque of 1313Nm (90 ft lbs).

82. Screw the control body hand tight. Insert the operating handle in the cylinder lug. Fit the "D" shaped thrust washer and adapter nut. Newer drills have this washer incorporated (machined) as a part of the cylinder lug bushing. Tighten the adaptor nut and control body into the operating handle

83. Fit the twist grip, two washers and the operating handle nut. Remember order in which the washers are fitted. Tighten the nut on the end of the control body

84. Fit the pressure relief valve. Make sure you have replaced the O-ring prior to installing the relief valve.

Running in

85. Place the assembled drill on the PHQ test bench and run for approximately 15 minutes at low throttle to "run-in" the assemble parts and insure the parts in the drill are fully lubricated before testing the torque of the drill. The PHQ test bench supplied with compressed air at a minimum volume of 5.0 cu m/m (175 cfm) and minimum pressure of 620 kPa (6 Bar) (90 psi) is required to adequately test Jackleg and Stoper Pneumatic Rock Drills.

Remove the Stoper control handle assembly from the drill
Connect the drill to the Stoper control adapter on the saddle.

Move the drill saddle forward with the pneumatic leg on the Stoper drill pressing against the stop.

Insert the spring loaded collared rod shank into the chuck bushing of the rock drill.

Rotate the control handle so the leg is at full force pushing the drill against the spring tension.

Run the drill under full leg pressure at partial throttle for no more than 15 minutes.

Running the drill under controlled conditions in the shop accomplishes several things:

- The rifle bar polishes the bronze of the rifle nut.
- The piston splines polish the bronze of the chuck driver nut.
- The drill doctor listens for irregular sounds and to be sure the drill runs smoothly.
- The drill doctor places his hand on the cylinder of the drill near where the front head joins the cylinder to check for heat that may be generated

If the drill sounds smooth during the running and the body remains fairly cool to the touch during and after the run in period the Rock Drill Doctor can be satisfied that the repairs were done properly and that the drill is running properly. This ensures smoother running later on when the drill is run at full throttle in actual drilling operations.

The drill is now ready for torque testing and already in the proper position on the test bench.

Testing the Stoper

Remove spring loaded shank steel assembly from the bench and replace with the torque test head

Before engaging the drill to the head make sure the torque head is “loosened off” at least five rotations. This will allow the drill revolution to build up momentum going into the torque test.

Move the drill forward with the pneumatic pusher leg of the Stoper.

Insert the rod shank adapter on the torque tester into the chuck bushing and close the steel retainer

Release the feed pressure by shutting off the air supply to the pusher leg and pushing the release.

With the drill in position and no pusher leg pressure suddenly throw the throttle handle forward opening the valve fully to operate the drill for a short burst at full throttle ending in a stall.

Observe the reading on the air consumption gauge, which should read 5000 LPM (170 CFM).

When the drill stalled the reading on the torque gauge should be minimum 2000 Nm (140 ft lbs)

PICTURE SHOWS A STOPER DRILL DURING RUN-IN PROCEDURE

Water Testing Procedure.

Testing of water connections and the flow of water through the drill can be accomplished while the drill is "running in" on the test bench.

The air connection to the drill is already in place, leave the air valve turned on.

Shut the hammering of the drill down temporarily using the throttle handle.

Connect the water hose to the proper connection on the drill and turn on the water valve.

Connect the banjo fitting on the spring loaded shank assembly to a drain hose (into a bucket)

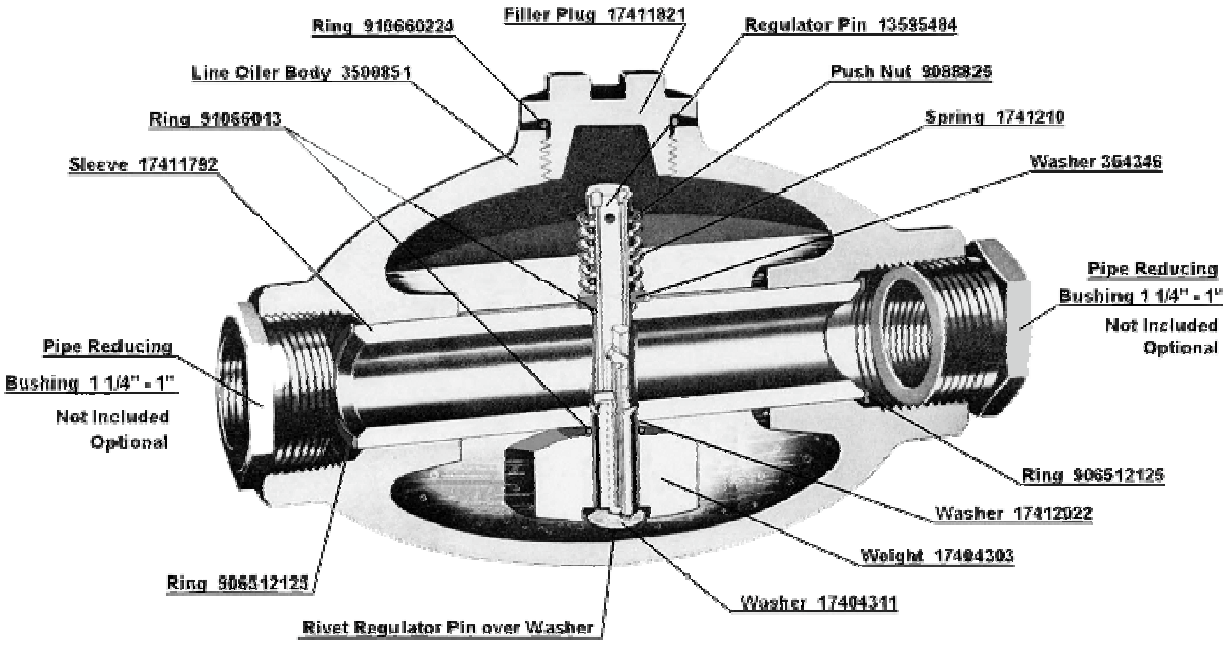
Advance the throttle handle forward to engage the valve to the second notch. Water should be exiting from the water tube at the front of the drill and coming out of the drain hose.

Return the throttle lever to the "off" position and the water should stop running in the drain.

With the water pressure still on check for leaks around the water inlet and automatic water valve.

NOTE: The water regulation control valve will not work if the water pressure supplied to the drill is equal to or greater than the air pressure supplied to the drill. The ideal air pressure for PHQ drills is 7 bar (100psi). The ideal water pressure is 3 bar (45 psi).

JOY Football Style Lubricator



The JOY football style lubricator (50481912) requires little or no servicing as the parts experience very minor wear in operation over long service intervals. When a used lubricator is returned to the drill shop it is usually sufficient to thoroughly wash out any accumulated dirt or debris in the reservoir of the lubricator with Varsol. Blow dry and rinse with oil before returning the lubricator to service. Relacement parts are avaliable though customers seldom buy any parts for lubricators. The threaded pipe bushings in the ports in the lubricator may need to be replaced after prolonged use. The safety filler plug (17411821) could be hammered on by drillers to the point where the shape has been damaged to the extent it can not be gripped by a wrench and needs to be replaced.

PHQ250 Stoper Parts Performance		Feet Drilled		Meters Drilled	
Part Number	Description	Soft Ground	Hard Ground	Soft Ground	Hard Ground
	SHOP TRIP	4000	3000	1200	900
D1611C	PAWL PLUNGER SPRING	4000	3000	1200	900
C1512	CHUCK NUT	5000	3500	1500	1000
D6177	RATCHET PAWL - REVERSIBLE	5000	3500	1500	1000
C1574A	WATER TUBE - SWAGED	5000	3500	1500	1000
S2134	PAWL PLUNGER	5000	3500	1500	1000
C1418A	CHUCK INSERT (7/8" HEX)	6000	5000	1800	1500
C1509	THROTTLE VALVE HANDLE	6000	5000	1800	1500
C1508	RIFLE NUT	7000	2500	2100	800
B2334	PISTON	9000	7000	2700	2100
JC45	SPUD ASSEMBLY C/W SCREEN	9000	9000	2700	2700
C2144	WATER VALVE SEAT RETAINER	10000	10000	3000	3000
D1675	WATER TUBE SEAL	10000	10000	3000	3000
B1178	CHUCK	12000	6000	3700	1800
D1388D	SIDE ROD NUT	13000	11000	4000	3300
D6205M	BUFFER FOR RETAINER	13000	11000	4000	3300
C1582C	SIDE ROD (STOPER)	15000	15000	4600	4600
355538A	SCREEN	15000	15000	4600	4600
C1809	HOSE STEM - THREADED TYPE	15000	15000	4600	4600
D1601	AIR BEND NUT WASHER	15000	15000	4600	4600
D2441	WATER INLET ADAPTER SPUD	15000	15000	4600	4600
S2141	WATER STEM NUT	15000	15000	4600	4600
C1517	FRONT CYLINDER WASHER LINER	16000	12000	4900	3700
C1809	HOSE STEM - THREADED TYPE	18000	18000	5500	5500
B1173B	RIFLE BAR (REVESIBLE)	20000	12000	6100	3700

PHQ250 Stoper Parts Performance		Feet Drilled		Meters Drilled	
Part Number	Description	Soft Ground	Hard Ground	Soft Ground	Hard Ground
B1176	THROTTLE VALVE	20000	15000	6100	4600
C1272	WATER INLET SCREEN	20000	20000	6100	6100
C1648	VALVE	20000	20000	6100	6100
C2213	BUCKET SPACER	28000	26000	8500	7900
C1526	AIR BEND NUT	30000	26000	9100	7900
D1406	WATER VALVE SPRING	35000	35000	10700	10700
S2128	VALVE BOX PIN	40000	30000	12200	9100
C1525N	AIR BEND	45000	45000	13700	13700
B1170	RATCHET RING (35 TEETH STANDARD)	50000	35000	15200	10700
A2598A	FRONTHEAD	50000	40000	15200	12200
A2599	STEEL RETAINER	60000	50000	18300	15200
A745	VALVE BOX	60000	50000	18300	15200
B1181PC4	WATER CONTROL VALVE BODY	90000	80000	27400	18300
D1383	PLUNGER FOR THROTTLE VALVE	100000	100000	30500	30500
E394M	STOPER CYLINDER - MUFFLED	200000	150000	61000	45700

Troubleshooting Guides

Problem	Probable Cause	Remedy
86. Rock drill will not start when throttle handle is advanced.	Air line supply blocked	Always blow the air hose. Check air connection screen.
	Piston sticks air hissing past	Cylinder may be dented or damaged. Replace cylinder at the rockdrill shop. (SM 45-50)
	Dirt in automatic valve assembly or valve gummed by thick oil	Return drill to rock drill shop to repair valve (SM 39-42)
	Automatic valve flooded by lubricant or gummed by grease	(SM 93)
	Ice in the muffler or exhaust ports	(SM 88)
	Damaged front cylinder washer	Hone or ream front cylinder washer or replace (SM 47-50).
87. Rock drill runs erratically or lacks power during drilling operations.	Lubricant too heavy (thick) for the ambient operating temperature.	(SM 93).
	Improper amount of lubricant.	(SM 93).
Penetration is erratic or slower than normal.	Valve chest sticking	Check parts for sharp edges. Check operation (SM 39-42)
	Side rods tightened unevenly.	Relax side rod nuts; re-tighten properly (SM 81)
	Parts broken inside the drill.	Replace broken parts at the rockdrill to shop
	Pawls and springs worn out	Replace broken parts at the rockdrill to shop (SM 73)
	Insufficient air supply to leg	(SM 94).
88. Water coming out of the exhaust ports on the drill.		Install water trap in pipeline. Blow moisture out of hoses.
Excess fogging in the work place area.	Excess water in the air entering the rock drill	Check water tube rubber seal. Check water tube for cracks or for breakage at the shank end.
Rockdrill freezing up and the muffler or exhaust ports are blocked with ice.		Water pressure must be less than air pressure by 30 psi.

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89. Drill Runs Sluggish	Excess water in the air Too much lubricant in drill	SM 88 Above SM 93. below
90. Drill sounds like it is running properly but it lacks drilling power.	Cuttings not being removed from the drill hole fast enough.	Use direct blow to remove cuttings (throttle handle back)
	Plugged drill steel or water tube.	Check and clean (SM 25)
Penetration into the rock face is too slow.	Loss of bit gauge causing binding of the bit in the drill hole	Gauge grind worn bits and color code by diameter size.
	Drill shank is too long or short	Check drill shanks regularly for damage or collar wear.
	Broken piston or worn piston face	Replace the drill piston at the rockdrill shop. (SM 45-46)
	Partially blocked air supply	Check air lines. Blow hose. Check air connection screen.
	Low air pressure	Minimum air pressure 80 psi Ideal air pressure 100-110 psi
	Lack of lubrication	(SM 93).
	Loss of cushion (compression) in the drill due to worn buffer ring or worn piston	Check front cylinder washer in the rockdrill shop and replace if worn (SM 47-50).
	Damage to the drill cylinder body. Drill cylinder body heating up.	Check the drill cylinder at the rockdrill shop. Look for wear to mating faces and check interior wear (SM 45-46) If worn replace the drill cylinder body in the rockdrill shop.
	Damaged Chuck Assembly	Check the chuck at the rock drill shop (SM 33) (54-61) Replace worn or damaged part
	Damaged Front End	Check the front end at the drill shop (SM 32-33) Replace.
	Pusher Leg not functioning	(SM 94).

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Problem	Probable Cause	Remedy
91. Bronze cuttings exhausting from rock drill ports.	Rifle nut failing. Rifle nut burned by overheating.	Rifle bar heat checked from lack of lubrication (SM 93). Rifle Bar failing or broken. Replace at rockdrill shop.
	Chuck nut failing Chuck nut burned by overheating	Piston heat checked from lack of lubrication (SM 93) Piston failing or broken. Replace at rock drill shop
92. Drill parts wearing faster than normal. **Service trips to rockdrill shop too frequent.**	Improper Lubrication. Dirt or debris entering the drill	(SM 93) Check front end blow Plug or cover all openings in the drill when in storage or moving between drill sites.
93. Faulty Lubrication **According to experts in the maintenance field:** ***"Lack of lubrication is the leading cause of failure of parts in machinery"!***	Lack of Lubrication	If using rock drill oil fill the lubricator at beginning of shift and check level mid shift. If using rock drill grease fill the lubricator at the beginning of each shift. Check lubricator flow setting. Lubricant high viscosity (too thick) for ambient temperature Drill hose maximum12 feet
	Wrong Lubrication	Use EP100 rockdrill oil or Triple zero Vultrex grease at temperatures -10 +40° Celsius
	Excessive Lubrication Automatic valve flooded by oil Automatic valve stuck with grease	Check lubricator setting Oil at a viscosity too low for a warm ambient temperature Grease may be too thick for a cold ambient temperature. Lubricator damaged.
	Excessive water in the air supply	Excessive water will wash lubricant out of the drill. (SM 88).

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Problem	Probable Cause	Remedy
94. Pusher Leg not functioning properly. **Drill is jumping on the leg during drilling operations.**	Insufficient (lack of volume) or erratic pressure supply of air to the pusher leg.	Leg control handle assembly O-Rings worn out (SM 6). Replace parts in rockdrill shop
	Bucket seals in leg worn	Examine and replace bucket seals in drill shop (SM 67)
	Bent piston rod	Check piston rod. Replace in drill shop if bent. (SM 67)
	Dented pusher leg cylinder	Check the cylinder for dents and replace in drill shop if dented. (SM 67)
95. Drill steel failing at the collar or forming a coke bottle shape. **Drill steel showing chips or chunks out of striking face at the collar end.** **Pistons in drills have chips out of the striking face or are failing at the striking face.** **Experience has proven:** ***"One chipped piston can damage a lot of new drill rods. One chipped drill rod can damage a lot of new pistons"!*** **They need to be removed**	Drill steel was worn or chipped to begin with.	Remove damaged steel from the circuit. Check piston.
	Piston in the drill has a chipped or broken front striking face.	Replace the piston. (SM 43) Replace steel chipped ends.
	Drill steel does not have a square face on the striking end.	Remove the drill rod from use and check the piston (SM 43)
	Refaced piston in the drill was not machined properly.	Replace the piston in the rock drill shop. (SM 43-44)
	Worn chuck insert	Check the chuck insert with gauge. If worn replace in the rock drill shop. (SM 33)
	Worn chuck assembly	Replace worn parts. Check drill steel ends for square.
	Collaring holes with drill steel longer than four feet.	Holes should be collared with two foot or four foot drill rods. Side pressure enlarges chuck inserts or breaks the insert.
	Running out the full length of the leg so that the lack of push makes the drill bounce on the drill rod	Always pull in the leg before reaching full extension and reposition to continue drilling.

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Problem	Probable Cause	Remedy
96. Drill steel does not rotate in the rock drill or has weak rotation.	Rifle bar or rifle nut worn out	Return drill to rock drill shop to replace rifle bar (SM 72) or rifle nut (SM 57-58).
	Worn chuck driver assembly	Return drill to rock drill shop to replace chuck driver nut (SM 59-61).
	Piston flutes badly worn or chuck nut worn out and stripped	Return drill to rock drill shop Replace piston (SM 43-44) or chuck driver nut (SM 59-61).
	Side rods tightened unevenly	Relax side rod nuts; re-tighten properly (SM 81)
	Lack of lubrication to front end.	(SM 93).
	Damaged front cylinder washer	Hone or ream front cylinder washer to proper fit or replace.
97. Stuck drill steel	Plugged drill steel or water tube	Remove and clear water tube.
	Broken water tube	Replace water tube (SM 30)
	Poor alignment of drill with hole	Always drill in line with hole.
	Low water pressure. Intermittent water supply	Check for water line blockage crimped water hose or plugged screen in water connection.
98. Drill overheating	.Over feeding rock drill can cause overheating of the drill body.	Maintain proper leg pressure so drill rod visibly rotates,
	Pulling drill steel with a machine run at high throttle and insufficient feed pressure allows the piston to freewheel in the drill and build up excessive heat.	When a drill hole is completed always pull the drill steel with the machine running at partial throttle. Use occasional bursts of full throttle to clear a hole.
	Following worn bits with oversize bits or using bits with gauge loss.	Gauge grind worn bits and color code by diameter size.
	Drilling with insufficient water to clear cutting drill rod stuck.	(SM 97).